RESEARCH PROGRAM ON
Roots, Tubers and Bananas

CGIAR

Workshop report:

Global Musa Expert Workshop -
Production constraints, yield gaps, and research strategies for smallholder banana production

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I. Introduction and Background

The workshop is part of a multi-crop priority assessment exercise coordinated by the CGIAR Research Program on Roots, Tubers and Bananas (RTB) to identify the problems scientists should solve first and solutions most likely to have a positive impact on food security and livelihoods. For the banana priority assessment, Bioversity International, CIAT, and IITA have teamed up to carry out an impact study in consultation with banana stakeholders from around the world. The study follows a six-step participatory methodology (please visit the following link for more details: http://www.promusa.org/tiki-read_article.php?articleId=65) and gives particular emphasis to the needs of poor farmers and other vulnerable groups.

The workshop in Kampala has a key function in this ex ante impact assessment in bringing together the global community of banana experts. The other major activities under the priority assessment study which feed into/complement the workshop are briefly described below:

1) An **online expert survey** has being conducted through ProMusa and the regional banana networks to short-list key constraints to banana production and marketing for the main production systems (in different regions). 524 experts from more than 54 countries have contributed. We have received input from scientists, extension staff, producers, the private sector, donor organizations and NGOs. In addition to generating survey results, we are compiling a database of banana experts around the world who we will keep informed about study progress and preliminary results and whom we can invite to further engage at different points based on their indicated expertise. For results please visit: http://www.promusa.org/tiki-read_article.php?articleId=92.

2) National banana experts are building an online **data base and map of banana production areas** by cultivar group. The interactive maps show production system characteristics along with specific constraints. Anonymous users can browse the maps and export the data. Registered users can edit spatial boundaries of production areas and review and update the production systems within each production area based on the established variables including total area by system, cultivars used, production inputs and the yield impact of pests and diseases. To check it out, please visit: www.crop-mapper.org/banana. The expert based crop mapper complements the **RTB maps** which are based on existing statistics and contain geographic information on crop distribution, area and yields, crop-specific agro-ecological zones and biophysical maps related to each RTB crop (http://www.cgiar-csi.org/portfolio-items/rtb-maps).

3) A **review of literature** and information on banana production constraints, yield levels and gaps and other factors useful for identifying potential research priorities is being conducted for high priority banana production systems by small groups of experts. The compiled review information will be accessible through Wiki pages on the ProMusa website. A brief online survey with a selected subsample of the expert survey was conducted to get quantitative estimates of yield levels and variability as well as major causing factors for the less common cultivar groups which will not be covered by working groups in the workshop.

II. Workshop Objectives

- ✓ Identify production constraints and quantify related yield gaps for main cultivar groups;
- ✓ Select 10-15 research options to be included in priority assessment;
- ✓ Quantify parameters for impact models and define their stochastic distribution;
- ✓ Strengthen innovation platforms for global banana research;
- ✓ Shared research planning experience among primary partners in banana for RTB;
- ✓ Strengthen national partner input and understanding of global banana research agenda;
- ✓ Learning experience for the use of e-communication tools to build innovation platforms.

III. Workshop Methodology (incl. e-Forum)

The main rationale behind organizing an online expert survey and convening a group of global experts in a workshop was to i) engage the global banana community in identifying research options to be included in the priority assessment in a participatory way; ii) ensure that selected research options address key constraints and opportunities to small-scale banana production, processing and marketing in target areas; and iii) consult global experts with a wide range of expertise to quantify model parameters needed to estimate potential impact.

Since the number of workshop participants was limited, an **e-forum** with discussion groups was organized through ProMusa and the regional banana networks in parallel to the meeting. The e-forum was real time, i.e. at appropriate points during the workshop (usually in the evenings), outcomes from group and plenary sessions were posted in the e-forum in three languages (English, French and Spanish) and the feedback received was reported back, reviewed by the groups and incorporated into the selection of research options and quantification of model parameters where applicable. This process facilitated the engagement of a wider group of experts and other stakeholders in the assessment.

An email announcement introducing the e-forum was send to all expert survey participants and all ProMusa contacts ahead of time. Alerts were sent to all survey participants every time new information was posted on the e-forum.

The workshop opened with a welcome from the country representatives of Bioversity and IITA, the hosting organizations, followed by an icebreaker to introduce participants to each other. To ensure all participants were familiar with the study and the selected approach, a session with four presentations provided an introduction to the RTB program, the RTB priority assessment exercise as well as an overview of the results of the online banana expert survey and concept and status of the banana mapper. Equipped with this information, participants were asked about their expectations with regard to the workshop and familiarized with the objectives of the meeting (please see Annex 3 and 4 for planned and actual workshop activities).

Participants then worked in small groups to estimate yield variability and related factors for the five main cultivar groups (AAA Cavendish, AAA East African Highland, AAB plantain, AAB not plantain, ABB Pisang Awak) and to ratify major constraints and key intervention options. Participants were allocated to cultivar groups based on their expertise (ensuring representation of different disciplinary backgrounds and diverse geographical expertise in each group).

Subsequently, potential intervention areas addressing the major constraints and/or focusing on other intervention options (opportunities) were identified by each cultivar working group with consideration given to recent/likely future trends. Next, the top five researchable intervention areas were selected in plenary by clustering all identified constraints and opportunities. Working groups formed around each of these five selected priority intervention areas and identified three potential research options each in consultation with the expert survey results. 10 priority research options to be included in the priority assessment were selected from the pool of suggested research options and cross-checked with the expert survey results. The identified priority intervention areas and research options are listed in the next section and Annex 3 contains a description of the research options synthesized from the group work.

For the remainder of the workshop, a working group for each of the selected priority research options was formed to describe research options in more detail and quantify the parameters required to estimate potential future impacts.

Parameters to be estimated include:

- research costs, development time and likelihood of research success;
- farm-level changes in yield and/or production costs (if there are differences separate estimates by country, geographic region, production system, or cultivar group);
- changes in post-harvest losses, crop quality, and/or processing costs;
- technology adoption (potential adoption area, adoption ceiling, start and pace of adoption);

In addition to these quantitative estimates, working groups identified major research outputs (adoptable innovations), potential major constraints to adoption as well as important partners both for the research phase as well as the dissemination of innovations.

The (main) model to estimate benefits will be an economic surplus model[1]. Subsequent cost-benefit analysis combines benefit estimates and related research and dissemination costs for the research option to a net present value (NPV) and internal rate of return (IRR). Both indicators account for the timing of benefits and costs. Expected research benefits will be disaggregated by region and the share of benefits accruing to poor households will be estimated separately. Sensitivity analysis will help to identify the most crucial variables and explore the effect of modified parameter assumptions. When modeling adoption, two different scenarios will be included: the first representing the status quo of national partner capacity and extension efforts/structures, and the second assuming an improved extension system.

In addition, scores will be assigned to each research option to reflecting likely effects on gender equity, human health and the environment to complement the quantitative model results. These scores can help to flag particularly negative or positive effects which may require more in-depth investigation before committing public funds to a particular research option. Participants in each working group were thus asked to indicate which score (-2 = very negative, -1 = negative; 0 = no change; 1 = positive; 2 = very positive; 9 = don't know) best describes the gender equity, human health and environmental effect of the new innovation (if adopted).

1 **Economic surplus** refers to the combined benefit consumers and producers receive when a good or service is exchanged. The **consumer surplus** is the difference between the maximum price a consumer is willing to pay and the actual price they do pay. If a consumer would be willing to pay more than the current asking price, then she is getting more benefit from the purchased product than she spent to buy it. The **producer surplus** is the benefit a producer receives from providing a good/service at a market price higher than what she would have been willing to sell for. Through economic modeling of the **supply and demand equations**, the two related quantities of consumer and producer surplus are determined. The consumer surplus (individual or aggregated) is the area under the (individual or aggregated) demand curve and above a horizontal line at the actual price (in the aggregated case: the equilibrium price). The producer surplus (individual or aggregated) is the area above the (individual or aggregated) supply curve and below a horizontal line at the actual price (in the aggregated case: the equilibrium price).

IV. Workshop Outputs

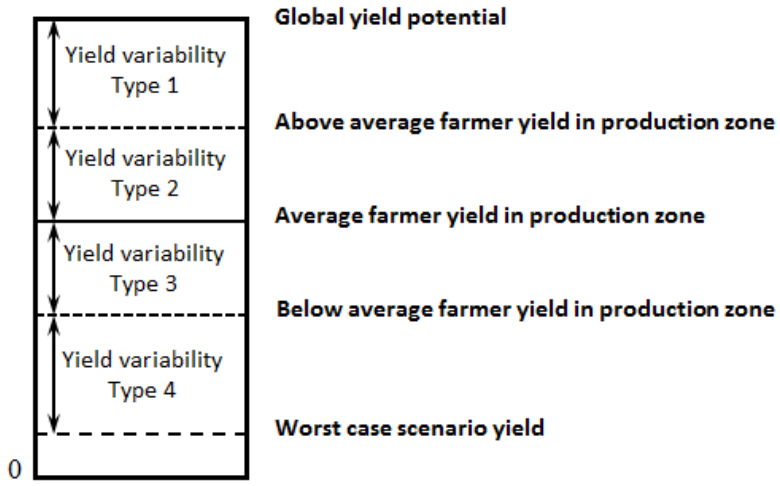
1) **Yield variability and key constraints**: Working groups for the five major cultivar groups quantified the yield potential following the below formula by Ortiz and Vuylsteke (1998):

Yield potential [t/ha] = **biggest recorded bunch weight** [kg] **x 365 x plant density** [ha-1] **/ (days from planting to harvest x 1000)**

Groups were then asked to identify major production zones or production systems which they are most familiar with for this particular cultivar group and from the resulting list, select two contrasting production systems in different production zones or common production system in two contrasting zones and briefly describe them in terms of location, altitude, rainfall (total amount and or length of dry season), cultivar name, and predominant production system.

For these two zones, groups estimated the average farmer yield [kg/ha/year], an above average farmer yield and below average farmer yield (using bunches ha/year and mats/ha), as well as a "worst case scenario" yield [kg/ha/year] if important pests/diseases and production problems are severe (see Annex 1 for results). As a next step, working groups identified major factors explaining yield differences (see Figure 1) for each of the two zones. In addition to listing production constraints limiting or reducing yield, groups were asked to identify 2-3 additional possible intervention options for smallholder systems which would contribute to yield or income for each of the production zones. Such intervention options (or opportunities) could e.g. be in the area of a) post-harvest, processing and marketing; b) intra-household roles, decision making, and resource allocation; and/or c) household resource endowment (incl. labor, capital, land, information).

Figure 1: Illustration of different types of yield variability



Finally, groups were asked to identify trends or (likely) future changes (e.g. climate change, spread of diseases) which may alter the importance of limiting factors or opportunities for smallholders producing this cultivar group.

Based on the factors explaining yield variability, other intervention options and trends and changes, each working group selected and ranked by order of importance up to 8 priority intervention options for the cultivar group which have applicability across major production zones (see Annex 2 for priority intervention options for each cultivar group).

The other results of the cultivar working groups are not included in this report for reasons of brevity but have been uploaded to and are available on the e-Forum which can be accessed by following the link: http://www.promusa.org/tiki-view_blog.php?blogId=23.

The identified 40 intervention options from the cultivar working groups were then clustered in plenary (see Figure 2) and the following 5 global priority intervention options emerged:

(A) Integrated cropping systems;
(B) Seed systems;
(C) Plant health management;
(D) Delivery systems;
(E) Genetic enhancement

Figure 2: Clustering of the identified 40 intervention options

Working groups formed around these priority intervention options and identified three distinct research lines each from which research options to be included in the priority assessment exercise were synthesized. Before and during this final step of selecting research options to be included in the *ex ante* impact/priority assessment it was stressed that arriving at this list does not mean that other areas of research are not or less important and nor does that mean that research areas not among the selected options will not be addressed by future RTB research.

Research options to be included were selected based on the following criteria:

- ✓ must result in adoptable innovations/technologies within <10 years;
- ✓ suitable to be addressed through RTB research;
- ✓ no other supplier of research (outputs) than RTB and partners;
- ✓ generate quantifiable impacts over the next 20 years that can be captured within economic models (such as yield and/or cost changes);
- ✓ experts are available to provide parameter estimates.

It was further stressed that the results of this priority assessment are only one of several types of input/information to the planning of RTB research lines in the upcoming years. Other areas of research such as gender studies and other cross-cutting themes are less suitable to be assessed using the methodology selected for this exercise but are of high priority for the RTB.

The plenary discussion on the selection of research lines was difficult and not very successful, partly because it was already late in the day and participants were getting tired, but also since there were strong and divergent views on how to design and select research lines. There was, for example an extended discussion on whether or not "seed systems" (e.g. the production and dissemination of high quality and pest/disease free seed) would be better kept as separate research line or incorporated in the disease specific research lines on e.g. banana bacterial and virus diseases. Similarly participants had a hard time to agree on how to include breeding in the/as research option(s). After some time it was suggested to discontinue the plenary discussion and instead leave the selection of research lines to a smaller group of "volunteers" and reconvene in the morning to discuss the proposed research lines.

The break-up group convened and suggested the following 8 research lines to plenary:

1. Integrated management of Fusarium wilts (diagnostic tools, epidemiology, clean seed, agronomic and cultural practices, soil suppressiveness)
2. Management of BBTV and other viral diseases (diagnostic tools, epidemiology, clean seed, banana-free fallows, agronomic and cultural practices)
3. Integrated management of bacterial wilts in smallholder systems (diagnostic tools, epidemiology, clean seed, cultural and agronomic practices, mat management)
4. Risk assessment, diagnostic tools, predictive models and strategies for banana disease surveillance and quarantine and containment
5. Market-driven intensified banana based cropping systems (including nutrients, water, quality planting material, pests and diseases such as weevils, nematodes and Sigatoka, cultivar selection, gender roles and resource control, etc)
6. Breeding for higher yield, pest and disease resistance and consumer quality for smallholder banana, plantain and cooking banana cultivars
7. Better use and availability of existing genetic diversity for biotic and abiotic stress and consumer quality through evaluation and clonal selection
8. Extending utilization and reducing post-harvest losses

The list of suggested research options was discussed in plenary in some length. Some participants felt that other pests and diseases namely nematodes, weevils and black sigatoka should be dealt with in separate research lines, but this was not the majority view.

Eventually working groups formed around the following nine priority research lines (refer to Annex 3 for a description):

1. Sustainable Fusarium Wilt management system
2. Recovery of smallholder banana production affected by banana bunchy top disease (BBTD)
3. Integrated management of XW and other bacterial diseases in small-holder systems
4. Risk assessment, diagnostic tools, predictive models and strategy for disease surveillance
5. Sustainable intensification of banana-based cropping systems
6. Rapid and enhanced genetic gains by diploid breeding
7. Breeding for host plant resistance to pathogens and pests in banana
8. Use/availability of existing genetic diversity for (a)biotic stress and consumer acceptability
9. Reducing losses and expanding utilization of banana products and waste

The parameter estimates developed for these research options by the working groups over the reminder of the workshop time are being synthesized but require some follow-up work. Thus numbers are not included in this report but will be available for public review/feedback on the banana priority assessment webpage.

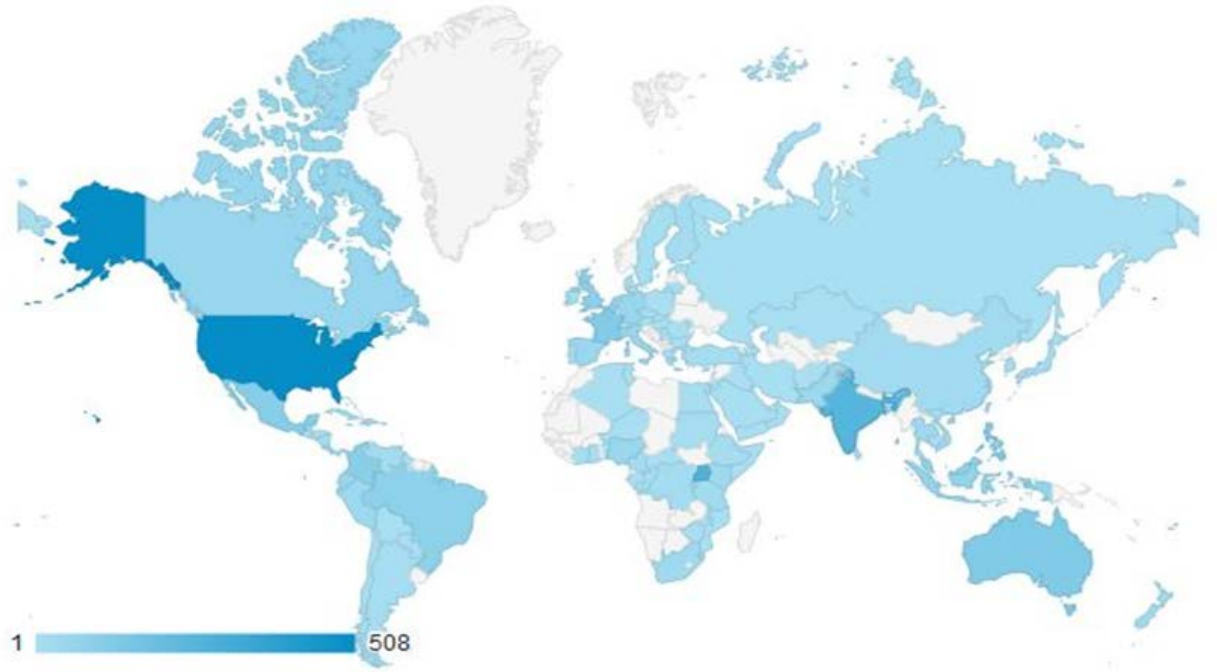
V. E-Forum Statistics

Workshop results from Days 1 and 2 were synthesized, translated and posted on the e-Forum on the evenings of Day 1 and 2, respectively. The results of Day 3 were only posted around midday of Day 4 and the list of selected research options including the description included in Annex 2 of this workshop report was posted on 29 April 2013.

From 1 to 15 April 2013, the ProMusa priority assessment website including the e-Forum page received 3,512 visits from 2,512 different visitors with a peak of some 550 visits on the third workshop day (April 10). Visitors looked at an average of 2.99 pages on the site (total of 10,532 page views) and were from 131 different countries around the world (see map in Figure 3).

The e-Forum alone received 1,268 page views from 1 to 15 April. 55% of these page views were received by the English language e-Forum pages, and 27% and 18% on the French and Spanish e-Forum pages, respectively. A total of 21 comments (6 out of which were from the organizing team) were posted on the e-Forum. All comments were written in English and refereed to workshop results of Day 1 (11 comments), Day 2 (8 comments) and Day 3 (1 comment).

Figure 3: Location of visitors to ProMusa priority assessment webpages (incl. e-Forum): 1 - 15 April 2013



VI. Methodological Reflections and Lessons Learnt

E-Forum: The e-Forum was an experiment to engage the global banana community in the RTB priority assessment exercise. The effort was very successful in terms of generating interest and sharing information – partly due to the posting of online expert survey results just prior to the workshop. It was less successful in engaging a wider community in the discussions on and the selection process of research options and has admittedly failed to feed external input into the quantification of model parameters. In retrospect, there are a number of reasons for this and of course valuable lessons learnt for similar future endeavors. First, the planned routine of posting workshop outputs got a bit hectic the last two days and we did not manage to process, translate and post results from the last day on time. Secondly, the original idea of a voting or "like" button which would have facilitated very quick and easy feedback was technically infeasible on the existing platform and thus not implemented. Thirdly, in the absence of detailed explanations and access to all the workshop material (incl. templates and instructions) it must have been increasingly difficult to follow the discussion, understand the steps of the process, and grasp the full meaning and scope of results. Finally, it became very clear that a dedicated e-Forum team with no other tasks/roles in the meeting and including a manager with technical expertise who could synthesize both workshop results as well as receive feedback and thus function as interface between workshop group and wider banana community and a support team of 1 – 2 persons who handle typing, formatting, translations and postings would have been necessary in order to cope with the task. However, this experiment shows that it is possible to use e-tools not only to share research findings but to engage a wider community of researchers and practitioners in the process of developing research strategies.

Workshop agenda: The agenda for this workshop was very/too ambitious, trying to accomplish several steps of the priority assessment process. In retrospect, it might have been a more successful and satisfying experience for all involved if the selection of research options had been done beforehand and the workshop had spent more time on training participants in the priority assessment methodology prior to soliciting parameters e.g. by demonstrating the whole process including running the model and interpreting results using one concrete example. Furthermore, it would have helped to have a skilled social scientist familiar with definition of parameters (both for technical and gender criteria) working with each of the groups in the elicitation process. The (repeated) steps of selection from a larger set to short-lists to derive at priority research options were perceived as elimination and were faced with substantial resistance by at least part of the participants. Also, the planned process, objectives and outcomes of the workshop were not communicated clearly enough or at least this information should have been repeated at strategic points in time.

Identification of research options: As mentioned in the previous paragraph, the process of identifying constraints/opportunities/trends, identifying intervention areas, selecting priority intervention areas, identifying research options, and finally selecting priority research options through several rounds of clustering and selection was lengthy and painful. This process could have been simplified or even accomplished prior to the meeting e.g. based on the online expert survey results and a subsequent step of ratifying potential options with the global banana and RTB community. Developing rather complex research options, phrasing them in a way suitable for the process and reaching a consensus on which options to select is inherently difficult to achieve in large plenary groups and predetermined by the composition (e.g. regional and technical background) of the group. The task was further complicated by strong and opposing interventions from senior group members which – especially since expressed in plenary – posed a major facilitation challenge and undermined the authority of the organizing team.

Finally, further confusion and resistance emerged after the presentation of RTB flagships since participants felt "manipulated" to align priority research options with existing flagships and were unsure about the role of the priority assessment in developing the future RTB research strategy. This issue was not resolved in subsequent discussions since the flagship process is very new and evolving at a fast pace.

Elicitation of parameter estimates: This was challenging for a number of reasons. First, scientists are uncomfortable providing rough estimates at a global level and under high levels of uncertainty. They may also overestimate benefits either out of strategic considerations (trying to make their area of research/expertise look better/more rewarding) or just because problems or constraints are still unknown. The convened group of banana scientists had had no or little previous exposure to ex ante assessment or priority setting exercises unlike staff at e.g. CIP - where this is the third major exercise in setting research priority, scientists are familiar with the process and can base their estimates on previous parameters. This study will help to build priority assessment capacity and the lessons learnt will improve future similar ex ante exercises. Secondly, the templates used for the elicitation of parameter estimates were not sufficiently tested since this was the first experience of the RTB priority assessment methods group with such a parameter elicitation.

Also, the instructions provided before the working group sessions were insufficient to explain what kind of information was required and where and how to insert the numbers in the templates. Ideally, the elicitation of parameter estimates would be done in a focus group discussion with a facilitator trained in the process and the economic methodology of ex ante assessment that would help guide the group through all required aspects and immediately intervene if the discussion loses focus, participants get confused or disagree on the

interpretation of questions. Alternatively the templates would need to include much more information and be structured in a way that examples are given along with clear instructions how to work with the template. Moreover, the level of disaggregation of the parameters in the template was insufficient e.g. all changes in yields or costs should be elicited per country (or even at cultivar / production system sublevel within a country if applicable).

Workshop logistics and support: A number of issues related to workshop logistics and support that could have been improved were highlighted during the methodological reflection sessions as well as during "after action" reviews of the workshop organizing team. It was suggested that formal name tags should have been handed out, that participants should have been introduced individually and a list of participants should have been provided at the very beginning of the meeting. The issue of time keeping was mentioned several times – and one if not the most important element would have been a more rigorous manner of facilitating plenary discussions and managing contributions from senior members of the group.

The existing support team was overloaded with the e-Forum and other logistic tasks leaving too few (or not well enough coordinated) hands for e.g. printing of materials, copying of presentations, support functions in the meeting (such as carrying around microphones during plenary sessions) and documentation of the process and results (note and picture taking).

Conclusions: It is evident from the above methodological reflections and lessons learnt sections as well as the workshop evaluation (Figures 4 and 5) that there would have certainly been room for improvement in the way the workshop was conceptualized and implemented. Despite all challenges, however, the meeting produced very tangible outcomes which have advanced the RTB banana research priority assessment substantially:

- Quantitative estimates of average farmer yield and **yield variability** for the five major cultivar groups in different production systems were produced by the working groups (see Annex 1) and major factors causing this variability were identified. Though these estimates are admittedly rough, very little data is available and the high level and broad scope of expertise of participants makes these figures and the list of constraints, opportunities and trends very valuable.
- A list of **priority research options** (see Annex 3) was developed and agreed upon by the group. While the process to arrive at this list was lengthy and painful at times, there is now buy-in from key stakeholders and scientists are more likely to support to subsequent steps of the priority assessment given their involvement in deciding on priority research options to be included. The selected options are line with the results of the global expert survey. Work is needed in terms of fine tuning these options and

possibly re-arranging subcomponents, but this should not be too difficult with the research option descriptions and contact persons from the expert groups available.

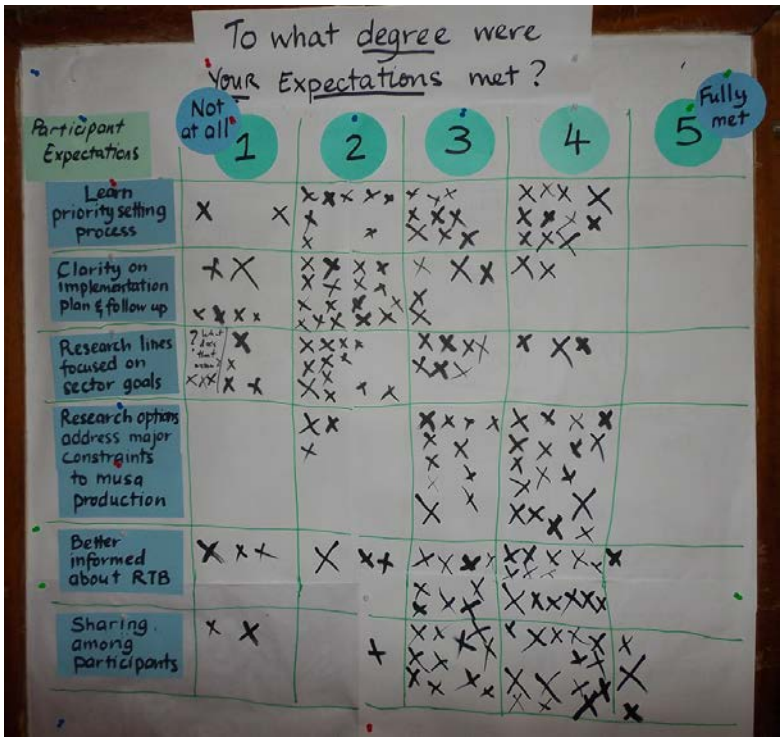
- Quantitative **parameter estimates** describing the impact of the selected research options have been completed by the groups. These are a good starting point and will be further disaggregated and cross-checked over the next weeks in collaboration with working groups, other experts and available information. It is extremely valuable that workshop participants now have a better understanding of the overall method, process and objective of the priority assessment exercise.
- Before, throughout and after the meeting there were numerous meetings in different small and larger groups to discuss other ongoing or possible future collaborations or just exchange ideas and learn from others' experiences. Moreover, a three day field trip was organized following the workshop to give participants the chance to learn about banana research and production in Uganda. The workshop thus provided an excellent **networking opportunity** for RTB members and partners.
- The experiment to **engage the global banana community** was very promising and will be continued and further refined using the established global contact database.

VII. Next Steps and Timeline for Completion of Priority Assessment

- Finalize the list of research options based on the inputs from the workshop and consultation with the priority assessment study group to ensure an appropriate fit with the economic surplus model. The draft list will also be taken back to our workshop participants along with a compilation of the parameters estimated in the workshop (timeline: early June)
- Consolidate all parameter estimates, fill gaps and validate figures. Post parameters for expert review and compare across research options (as well as across RTB crops) to ensure coherence of estimates (timeline: mid-June)
- Consult regional experts on likely adoption of research outputs (timeline: end June)
- Validate and fine-tune estimates for costs of research options (timeline: end June)
- Run the model and share preliminary results (timeline: end July)
- Obtain feedback on model parameters, assumptions, preliminary results (end August)
- Make final results of banana priority assessment available (timeline: September)

Figure 4: Participant evaluation of degree to which workshop objectives were met

Figure 5: Participant evaluation of degree to which their expectations were met



Annexes

Annex 1. Working group results: Yield variability

Cultivar group	Biggest recorded bunch [kg]	Days to harvest	Planting density [plants/ha]		Potential yield [t/ha/year]	
			High density annual planting	Perennial monoculture	High density annual monoculture	Perennial monoculture
AAA_Cavendish	130	495	2500	2400	240	230
AAA_EAH	75	450	1500	1500	91	91
AAB_Plantain	NA	NA	NA	1667	14	20
AAB_not plantain	60	300	NA	1600	NA	116
ABB_Pisang Awak	75	450	1000	900	60.83	54.75

Cultivar group	Cultivar name	Production system		
		ID	Description	Country/ies
AAA_Cavendish	Cavendish subgroup	1	Near intensive production export system	India, Brazil, Australia, China
	Cavendish subgroup	2	Mixed small holder systems	Indonesia
AAA_EAH	AAA_EAH	1	Mid-altitude: dominant highland cooking banana	Lake Victoria zone (central/south Uganda, NW Tanzania, East Rwanda)
	AAA_EAH	2	High altitude: mixed highland cooking and beer banana systems	Albertine Rift, Mt. Elgon, Mt. Kilimanjaro, Pare Mountains
AAB_Plantain	False Horn	1	Plantain-based systems with short fallow and not more than two (2) crop cycles	Nigeria: degraded forest
	French	2	Backyards with household refuse as inputs	Cameroun: household and backyards
AAB_not plantain	Prata-Ana	1	Perennial monoculture under irrigation	Bahia-Brazil
	Kamaramasenge	2	Perennial and intercropping system	East Africa (Low land areas): Burundi-Rwanda-Uganda and DR Congo
ABB_Pisang Awak	Karpooravalli	1	Small-holder monoculture 1+2, irrigated	India, Southern India
	Kayinja	2	Low-maintenance, perennial, rain-fed, low-density	Uganda, Tanzania, Rwanda, Burundi, Eastern DRC

Annex 1. Working group results: Yield variability

Cultivar group	ID	Above average farmer			Average farmer			Below average farmer			Worst case scenario
		Yield [t/ha/year]	Bunches/ha/ year	Mats/ ha	Yield [t/ha/year]	Bunches/ ha/year	Mats/ ha	Yield [t/ha/year]	Bunches/ ha/year	Mats/ ha	Yield [t/ha/year]
AAA_Cavendish	1	45	2340	1800	35	2340	1800	25	2340	1800	12
	2	9.8	390	300	5.2	260	200	2	120	100	0.5
AAA_EAH	1	30	NA	1500	15	NA	1100	8	NA	1000	5
	2	70	NA	2500	25	NA	1800	15	NA	1300	10
AAB_Plantain	1	10	1667	667	6	1000	1200	3	500	700	1
	2	10	1667	NA	7	1.4	NA	5	1.4	NA	4
AAB_not plantain	1	40	1600	1600	35	1600	1600	12	1600	1600	5
	2	27	400	400	20	400	400	5	400	400	2
ABB_Pisang Awak	1	25.6	900	1000	20.1	900	1000	14.6	900	1000	0
	2	23.7	1300	1500	11.9	1300	1600	3.3	1200	1700	0

Annex 2. Working group results: Priority intervention options by cultivar group

AAA Cavendish

We do NOT prioritize the following intervention options as they are location specific.

- Improved black Sigatoka management including alternatives to fungicides
- Mitigation and prevention of spread of Fusarium wilt, BBTV and BXW
- Improved cropping system including pest control
- Improved seed systems
- Farmers organization, including capacity building
- Improved postharvest and processing practices
- Improved marketing systems
- Improved political and institutional frameworks

AAA East African Highland

1. Presence of diseases and pests: banana weevil, nematodes, BXW, Black Sigatoka
2. Poor soil and water management
3. Lack of clean & quality planting material
4. On and off farm post-harvest losses: perishability, bulkiness, lack of value addition raises transportation costs
5. Poor markets access: fragmented (producers not organized), unlinked, disorganized
6. Limited policy support and financial investment
7. Low genetic yield
8. Lack of coordination of banana research agenda at the discipline level

AAB Plantain

1. High through put production of healthy quality planting material (to allow for other interventions)
2. Agronomy- Dissemination of improved crop and resources management practices in plantain-based systems
3. Breeding- Whole plant resistance –black sigatoka, lesion and burrowing nematodes, BBTV
4. Decide and act on BSV affecting multiplication and exchange of germplasm
5. Improving the morpho-physiology of plantain (poor root system, apical dominance in mats leading to yield decline and poor suckering)
6. Postharvest –Improving hybrid with desired characteristics for local market
7. Improving cultivars with short crop stature and crop cycle
8. Integrated soil fertility management for plantain-based farming systems

AAB not plantain

1. Social organization of farmers / community based system to better organize production/marketing
2. Government support in organization of farmers
3. Diseases diagnostic / quarantine and management
4. Promote the use of clean planting material
5. Develop improved varieties: more productive, resistant to main diseases and of high fruit quality
6. Improve irrigation skills of farmers
7. Better nutrition of banana plants: Fertilizers, manure and compost
8. Increase awareness of farmers by trainings and feedback on different topics related to banana production and chain value

ABB - Pisang Awak

1. Improved processing; development of better high-value products (reasons: high yield potential, consumer preference, high Brix)
2. Value chain development: Increase production and link farmers with urban processors, and development of rural processing facilities, product differentiation / diversification (quality, packaging, …), improved transport and marketing opportunities
3. Increased use of GR (screen of ABB types for East Africa) for productivity and Foc and BXW resistance, including selection of better clonal variants, and GMOs for BXW and Foc
4. Access to high-yielding, disease-free good planting material
5. Improved field management (disease - Foc, BXW, BBrMV, irrigation, de-suckering, weeding, …) and extension (mindset has to be changed)
6. Improved labour use efficiency, both in production and processing
7. Explore new production areas

Annex 3. Description of selected research options

1) Risk assessment, diagnostic tools, predictive models and strategy for disease surveillance

Target domain: Great Lakes region – southern Uganda / E DRC / NW Tanzania / Burundi / Rwanda where significant % of population is resource poor and mal-nourished and dependent on banana;
Intervention: Safeguarding banana production from exotic disease incursion and further spread of endemic diseases; i.e. prevent introduction of: TR4, Freckle, Ralstonia (blood and Moko), bract mosaic and mosaic; and improved management systems through rapid and precise detection and appropriate management of BXW, BBTV, FOC, Sigatokas (*Mycosphaerella musicola, M. fijiensis, M. emusae)*, and nematodes (emerging *Pratylenchus* in addition to *Radopholus)*;
Research outputs: i) national, regional, continental and global disease distribution maps;
ii) diagnostic tool kits for lab and field (factsheet, diagnostic keys, manuals, serological and molecular methods); iii) agreed contingency plans to limit exotic disease outbreaks;
iv) establishment of protocols for management of the further spread of endemic diseases; v) technical capacity created for disease diagnostics and reporting for research, extension and regulators; vi) create and manage knowledge database; vii) develop risk assessment criteria for introduction of exotic and management of endemic diseases to guide target areas surveillance, to refine mitigation strategies based on critical control points as influenced by cultivation and trade parameters;
Expected timeline:

- Phase I (0 - 1 years): **Scoping study –** literature search; evaluation of current field conditions and individual and institutional competences; implementation framework
- Phase II (1 - 5 years): **Implementation and evaluation of system -** capacity building; test responsiveness of system to curtail disease incursions and spread; recommendations on how to optimize methods, responsibilities, knowledge sharing; identification of diagnostic needs; development of prototype tools;
- Phase III (5 – 15 years): **Sustainability and implementation of system.** Refinement of methods incl. diagnostic tools and feedback loops to refine mechanisms;

Adoption: protection of yield on area grown with susceptible cultivars where disease is currently not present (use likely pattern and speed of disease spread instead of adoption curve);
Impact type: yield losses averted; avoidance of price increase (likely if local production eradicated); increased investment in banana sector due to higher level of confidence in disease prevention, containment, and/or eradication;

2) Integrated management of XW and other bacterial diseases in small-holder systems

Target domain: East and Central Africa (Uganda, Kenya, Rwanda, Tanzania, DR Congo, Burundi and Ethiopia); Asia and Latin America (for transgenic varieties);
Intervention: Developing and deploying resistant varieties; evaluation and dissemination of genotypes escaping insect vector transmission; assessing constraints to adoption, understanding gender roles for enhanced adoption, raising public awareness to enhance adoption; develop low-cost macro-propagation units, develop stakeholders' platforms for delivery of clean and/or resistant planting materials; better understanding of host-pathogen interaction for more easily adoptable control packages; socio-economic impact assessment;

Research outputs: i) resistant varieties developed and deployed (GM); ii) improved cultural practices validated and disseminated; iii) low-cost field diagnostic kit developed and deployed;
Expected timeline:
1) 7 years to obtain research output "GM variety", one more year before dissemination starts, dissemination phase of 10-15 years;
2) 5-7 years to obtain research output "improved cultural practices", dissemination would start at onset of project (continuous fine-tuning of package during project duration), dissemination phase of 3 -5 years;
3) 4-5 years to obtain output "diagnostic kit"; dissemination phase of 3 -5 years once output ready;
Adoption: 1) GM variety: adoption starts in year 8, ceiling of 75% reached 5-10 years after first adoption; 2) Varieties that escape insect-mediated wilt infection; adoption starts in year 5; 75% ceiling in 3-5 years after adoption; 3) Improved cultural practices: starts in year 1, ceiling of 75% reached 5 – 7 years after first adoption
Impact type: yield loss prevented; yield recovery where disease has already reduced yields; yield increase due to improved cultural practices; small scale banana-based industries revived;

3) Recovery of smallholder banana production in areas affected by banana bunchy top disease

Target domain: diverse smallholder perennial systems of EAHB, Plantain (AAB), AAA-Cavendish in Asia (Philippines, Taiwan, Vietnam, Sri Lanka), West and Central Africa (DR Congo, Republic of Congo-Brazzaville, Equatorial Guinea, Cameroon, Central African Republic, Gabon, Benin, Nigeria), East Africa (Burundi, Rwanda), and Southern Africa (Malawi, Angola, Zambia)
Intervention: clean seed supply through tissue culture and/or macro propagation, community strategies for a fallow period free of bananas, approaches for reducing re-infection and parallel cropping system intensification
Research outputs: i) Diagnostic tools; ii) genetic resource evaluation for mechanisms of tolerance and susceptibility and expression of symptoms; iii) strategies for supplying clean planting material; iv) epidemiology of BBTV and aphids; v) piloting integrated approaches to the recovery of BBTD affected areas
Expected timeline:

Phase I (0 - 5 years): pilot approaches based on existing information/ technologies
Phase II (5 - 10 years): improved pilot approaches incorporating lessons/research results of P I
Phase III (10 - 20 years): large scale use of outputs (based on strategies developed in P I and II)

Adoption: expected to start in year 6, ceiling of 50-80% reached in year 20 (region specific)
Impact type: yield loss prevented; yield recovery where disease has already reduced yields, NR effects due to shifts to annual crops such as cassava which may result in greater soil erosion.

4) Sustainable intensification of banana-based cropping systems

Target domain: smallholder farmers that potentially have good access to (urban) markets and grow plantain (AAB) in West and Central Africa and Latin America, EAHB in East Africa, dessert bananas in Southern Africa, East and West Africa and Asia and ABB in Asia.

Intervention: Integrated crop intensification package adapted to the local biophysical and socio-economic environment. The composition of the intensification package will depend on key production and market constraints and opportunities and can include (a) quality planting material, (b) improved timing of production through adapted sucker/planting timing, (c) suitable varieties, (d) integrated soil fertility management (ISFM), (e) integrated pest management (IPM) of weevils, nematodes, leaf diseases, (f) alternative plant densities, (g) irrigation / water management, and (h) novel and improved intercrop systems

Research outputs: i) Diagnostic survey tools and models to identify key constraints and related entry points to improve yields -> decision making tools to prioritize investments; ii) Targeted technology pathways and packages for improved productivity; iii) Communication / training tools, including. technical sheets, short videos to reach end-users through training of trainers, (innovative and effective) farmer organizations

Expected timeline: Phase I (0 - 5 years): product identification, development and testing
Phase II (5 - 10 years): validation, local adaptation, scaling out strategy & tools
Phase III (10 - 20 years): scaling out

Adoption: expected to start in year 5, ceiling of 80% reached in year 20

Impact type: yield increase, NR effects, reduced prices (for urban consumers)

5) Sustainable Fusarium Wilt management system

Target domain: Disease affected area of Cavendish, Gros Michel and others (AAA), Prata and Silk subgroups(AAB), Pisang awak and Bluggoe ABB types grown by small scale banana farmers; LAC: 30% of area with Cavendish and Gros Michel (AAA), Silk, Prata (AAB) and Bluggoe and Pisang awak ABB types; Tropical Asia: 80% of Cavendish and other AAA group, Silk (AAB) and Pisang awak area; South Asia: 60% of pisang awak and silk area in India and Bangladesh; South Africa: 40% of Cavendish area; WC and E Africa: ?);

Intervention: Develop and promote sustainable integrated management approach of Fusarium wilt;

Research outputs: i) resistant varieties; ii) improved cultural practices; iii) biocontrol procedures, including suppressive soils; iv) *Fusarium* population structure knowledge & race specific diagnostic tool; v) improved seed multiplication and distribution;

Expected timeline: 9 years to obtain all research outputs (some outputs will be achieved earlier i.e. during project duration); 1 year gap after outputs are available before dissemination will start (capacity building, training and lobbying among NARS, NGO´s, Private entrepreneurs, Ministries of Agriculture, Plant protection organizations);

Adoption: Asia: expected adoption ceiling of 80% of target area reached 5 years after first adoption; LAC and Africa: expected adoption ceiling of 40% of target area reached 8 years after first adoption;

Impact type: yield loss prevented; yield recovery where disease has already reduced yields;

6) ***Rapid and enhanced genetic gains by diploid breeding***

Target domain: cultivar groups targeted: (a) AAA East African highland bananas, (b) AAB plantains, (c) AAB dessert bananas, (d) AAA dessert bananas; geographic regions targeted: (a) Great Lakes Region of Africa: (b) West and Central African lowlands + Congo basin: (c) Brazil and India; (d) Global smallholders for local markets

Intervention: recurrent selection with progeny testing to improve diploid populations to generate elite diploid hybrids for further used as parents in 3x-2x or 4x-2x inter-mating. Tools such as marker-aided breeding, double haploids, genomic selection (including the use of genotyping-by-sequencing or next generation sequencing) will be applied to the diploid breeding populations;

Research outputs: Improved diploid populations and elite diploid parents as per end-user demands

Expected timeline: 4 breeding cycles of 4 years each (due to mandatory progeny testing, particularly when pursuing reciprocal recurrent selection);

Adoption: Improved parents for breeding will available 4 years after each cycle of recurrent selection; outputs very likely to be used in breeding due to the lack of elite diploid breeding materials for use as parents in Musa genetic enhancement; likely users of the research outputs: IITA, NARO, CARBAP, ICAR, EMBRAPA, CIRAD and other NARS elsewhere, particularly those newly engaging in Musa breeding; time required for new varieties based on improved parents to be available to farmers depends on next breeding step (i.e., their use for producing polyploidy hybrids) under each target trait, e.g. for host plant resistance to black leaf streak, Panama disease, bacterial wilt, banana weevil and other pests

Impact type: research is targeting producing intermediate products that will accelerate and enhance genetic gains in plantain and banana breeding. The impact will be measured in terms of diversity of diploid sets of elite parents with required target traits as defined by end users. Long term benefits will be improved yields (as measured by unit of time and space) in banana and plantain cultivars;

7) **Breeding for host plant resistance to pathogens and pests in banana**

Target domain: (affected) small holder production areas of

i) Highland bananas in Great Lakes Region
ii) Plantains in West, Central and East Africa, India, Brazil and other Latin American areas;
iii) Sweet acid banana in Brazil, India, and sub-Saharan Africa;

Intervention: mitigating losses from the mentioned pests/diseases (namely black leaf streak, nematodes, banana weevil and Fusarium wilt) through breeding for enhanced host plant resistance and improved management;

Research outputs: i) East African highland bananas resistant to nematodes, weevils, Fusarium wilt (FOC) and black leaf streak (BLS) and appropriate fruit quality; ii) plantain resistant to BLS, nematodes, weevils and with improved suckering and fruit quality traits; iii) sweet acid banana resistant to FOC, BLS, nematodes, and with improved fruit quality traits

Expected timeline: Time required to complete research outputs: 8 years;
Adoption:

i) East African highland banana: exp. adoption ceiling 60% reached 10 years after first adoption

ii) Plantain:

Brazil: expected adoption ceiling of 70% reached 15 years after first adoption
India: expected adoption ceiling of 20% reached 25 years after first adoption
East Africa: expected adoption ceiling of 100% reached 30 years after first adoption
West Africa: expected adoption ceiling of 50% reached 20 years after first adoption
LAC: expected adoption ceiling of 25% reached 15 years after first adoption

iii) Sweet acid banana:

Brazil: expected adoption ceiling of 70% reached 10 years after first adoption
India: expected adoption ceiling of 20% reached 25 years after first adoption
East Africa: expected adoption ceiling of 90% reached 30 years after first adoption
West Africa: expected adoption ceiling of 25% reached 30 years after first adoption

Impact type: reduced yield loss from specified pests/diseases.

8) Better use / availability of existing genetic diversity for (a)biotic stress and consumer acceptability

Target domain: 50% of all banana production area (excluding Cavendish) globally across all regions for production systems ranging from backyard to monocrop systems;
Intervention: i) Better characterization/evaluation of edible land races (based on consumer preferences) and ii) systematic survey and evaluation of desired traits; methods to be applied: for i) survey of existing collections, select/multiply/clean; molecular/morpho-characterization, evaluation under varying conditions (space and time); ii) looking for naturally occurring clonal variation, inducing variability (e.g. in vitro culture, mutagenesis), identify/collect/multiply/evaluate/validate
Research outputs: i) Catalog of landraces evaluated for specific traits (useful for specific agro-ecologies); ii) catalog of superior clonal selections with stable traits; iii)
Expected timeline: Output i) characterization/evaluation of edible land races

Phase I (0 - 2 years): Survey existing diversity and characterization
Phase II (3 - 4 years): Finalize characterization+ select + clean + multiply
Phase III (5 - 6 years): Evaluation under standard conditions and validation

Output ii) systematic survey and evaluation of desired traits

Phase I (0 - 2 years): Looking for naturally occurring variation or inducing variability
Phase II (3 - 4 years): Identify (morpho / molecular characterization); select + clean + multiply
Phase III (5 - 6 years): Evaluation under standard conditions and validation

Adoption: Dissemination will start 4 years after research outputs have been completed (capacity building, training, lobbying with NARS, NGOs, nurseries, farmers organizations, extension agencies)

Asia: expected adoption ceiling of 60% reached 10 years after first adoption

Africa: expected adoption ceiling of 60% reached 10 years after first adoption

LAC: expected adoption ceiling of 60% reached 10 years after first adoption

Pacific: expected adoption ceiling of 40% reached 10 years after first adoption

Impact type: slow down or reverse of decreasing productivity trends; higher yields and improved productivity of system; reduced yield variability (risk reduction); banana production systems cope better with expected climate change related trends in pest and disease pressure and altered production conditions;

9) Reducing losses, expanding utilization of banana products and waste in

Target domain: Small and medium scale producers (for plantain processing and PHH options) in West and Central Africa and India; processors of banana (by-)products (East Africa and Latin America);

Intervention: Reducing post-harvest losses and waste and/or expanding use of waste, decreasing processing costs and increasing income for small-scale producers/processors through improving post-harvest systems (just in time supply); processing and value addition (developing rural agri-business options for improved income and gender equity);

Research outputs:

i) A system developed for timely delivering of high quality banana from producers to (actors further up the value chain such as retailers and ultimately) end-users

ii) Technologies developed for value addition and increased commercialization of banana-waste

iii) Processing technologies for banana-juice (EA) and plantain chips (WA) adapted to the local condition of mini and small-sized companies in E and W Africa

Expected timeline: research outputs obtained within 3 – 5 years

Adoption:

i) Just in time supply system: dissemination starts 2 years after research outputs are available (dissemination through, private sector, NGOs and government extension system); expected adoption ceiling of 40% reached 10 years after first adoption

ii) Adapting technology for waste use for local conditions: dissemination starts in 2nd year of research; (dissemination through private sector NGOs and government extension system); expected adoption ceiling of 70% reached 5 years after first adoption

iii) Adapting processing technology to local conditions: dissemination starts 1 year after research outputs are available (dissemination through SME and NGOs); expected adoption ceiling of 50% reached 10 years after first adoption

Impact type: reduced post-harvest and handling losses; lower processing costs; higher income for producers engaging in processing/value addition and selling by-products; increase in farm-gate price due to improved quality of produce (and reduced risk); improved market access (price premium);

Annex 4. Workshop Program – planned

DAY 1 - 8TH APRIL 2013

8.30 am - Opening and welcome

- Welcome to Uganda from Dr. Emily K. Twinamasiko, Director General of NARO (National Agricultural Research Organization) and three hosting CG centers *(Piet van Asten - IITA, Eldad Karamura - Bioversity, and Dominique Dufour - CIAT),* incl. brief presentation of participants
- Director General NARO invites the Honorable Minister to address the meeting
- Opening speech by Hon. Tress Bucyanayandi, Minister for Agriculture, Animal Industry and Fisheries (MAAIF), Uganda

9.00 am - Overview of banana priority setting project

- Introduction to RTB and priority setting study *(Guy Hareau)*
- Banana priority setting methodology: Step by Step *(Tahirou Abdoulaye)*
- Procedure and results from participatory mapping *(Charles Staver)*
- Procedure and results from on-line expert survey *(Diemuth Pemsl)*

10.30 am - Tea break

11.00 am - Overview of global expert workshop

- Introduction of participants *(Meena Arivananthan)*
- Review of expectations and experience with priority setting *(Meena Arivananthan)*
- Outline of workshop objectives and suggested procedure *(Diemuth Pemsl)*
- E-forum introduction and suggested procedure *(Geert Claessens & Claudine Picq)*
- Workshop house-keeping and questions *(Siifa Balinda Lwasa & Geert Claessens)*
- Output of priority setting exercise, relevant impact models and parameter needs *(Diemuth Pemsl)*

12.30 pm - Lunch break

2.00 pm – Model parameters I

- Instructions for group work and example how to fill the provided templates *(Charles Staver)*
- Break-up into working groups (AAA/diploid; AAA EAH; AAB plantain; AAB not plantain; and ABB)

2.15 pm - Working groups (by cultivar group) – including 3.30 pm tea break

- Quantify yield potential of the cultivar group
- Identify and describe two contrasting typical production zones (abiotic/biotic factors)
- Quantify average yields and yield variability for contrasting zones
- Identify major probable factors in yield variability
- Compile list of additional intervention options from the general areas of i) post-harvest, processing and marketing, ii) intra-household roles, decision making, and resource allocation, iii) household resource endowment (labor, capital, land, information); for each of the production zones

- Compile list of trends or (likely) future changes (e.g. climate change, spread of diseases)
- Short-list and rank up to 8 priority intervention options from all identified (production) constraints and other intervention options (considering trends if applicable)

5.00 pm – Plenary session

- Share and discuss working group results
- Log of methodological issues: "What would we do differently the next time?"

→ ***Make results available to stakeholders via e-forum***

DAY 2 - 9TH APRIL 2013

8.30 am – Plenary session

- Opening and agenda for the day *(Diemuth Pemsl)*
- Participant feedback on Day 1 *(Meena Arivananthan)*
- E-forum feedback on yield gaps and intervention options *(Geert Claessens & Claudine Picq)*

9.00 am – Working groups by cultivar group

- Finalize list of top 8 intervention options by cultivar group based on e-forum feedback

9.30 am – Plenary session: Selection of intervention options

- Cluster the 5 x 8 intervention options
- Select top five researchable intervention options *(Meena/Diemuth)*
- Cross-check selected intervention options with regional priorities reported through expert survey
- Break-up into working groups (by intervention option) *(Meena Arivananthan)*

→ ***Make results available to stakeholders via e-forum***

10.30 am - Tea break

11.00 am - Working groups by intervention option

- Identify up to three distinct research options addressing the specific intervention option

11.30 am – Plenary session: Cluster research options

- Presentation and discussion of group results
- Clustering of research options (identify 10 distinct research lines)

→ ***Make results available to stakeholders via e-forum***

12.30 pm - Lunch break

2.00 pm – Plenary session: Overview of RTB flagships

- Introduction to RTB flagship process *(Graham Thiele)*
- Presentation of draft banana flagships (and relevant cross-cutting ones) *(Dietmar Stoian)*
- Discussion on differences/congruency of selected intervention options/research options and the suggested RTB flagships, exploring potential "blind" spots and ways to address them *(Meena)*
- Potential modification of research option list for banana priority setting (Meena)

3.30 pm - Tea break

4.00 pm – Plenary session:

- E-forum feedback on intervention options and research options *(Geert Claessens & Claudine Picq)*
- Finalize list of 10 research options for banana priority setting based on e-forum feedback (Meena)
- Log of methodological issues: "What would we do differently the next time?"
- Break-up into working groups by research option (cluster) based on participants expertise

4.30 pm – Working groups (by research option)

- Discuss status of research (planning) for the respective research option(s)
- Source any available existing major proposals for such research
- Profile of the research option(s) using template

→ ***Make results available to stakeholders via e-forum***

DAY 3 - 10TH APRIL 2013

8.30 am – Plenary session: Model parameters II

- Opening and agenda for the day *(Diemuth Pemsl);* participant feedback on Day 2 *(Meena)*
- E-forum feedback: update on intervention options/research options *(Geert Claessens & Claudine Picq)*
- Finalize list of research options based on e-forum feedback *(Meena Arivananthan)*
- Instructions for group work and example how to fill the provided templates (Diemuth)

9.00 am - Working groups by research option (including 10.30 am tea break)

- Quantify parameters for impact models: A – Description of research options

→ ***Make results available to stakeholders via e-forum***

12.30 pm - Lunch break

2.00 pm – Plenary: Model parameters III

- Instructions for group work and example how to fill the provided templates (Diemuth)

2.15 pm - Working groups by research option (including 3.30 pm tea break)

- Quantify parameters for impact models: B – Yield, quality, cost, post-harvest, and processing effects

→ ***Make results available to stakeholders via e-forum***

5.00 pm – Plenary session

- Share group results for parameters type A and B *(Meena Arivananthan)*
- E-forum feedback on model parameters type A *(Geert Claessens & Claudine Picq)*
- Log of methodological issues: "What would we do differently the next time?"

7.00 pm – Social event: Snacks, drinks and music by the lake

DAY 4 - 11TH APRIL 2013

8.30 am – Plenary session: Model parameters IV

- Opening and agenda for the day *(Diemuth Pemsl);* Participant feedback on Day 3 *(Meena)*
- E-forum feedback: update on parameters type A and B *(Geert Claessens & Claudine Picq)*
- Methodology to assess environmental, gender, health, and NR impacts *(Ulrich Kleinwechter)*
- Instructions for group work and example how to fill the provided templates (Diemuth)

9.30 am - Working groups by research option (including 10.30 am tea break)

- Discuss e-forum feedback and revise parameters type A and B if necessary
- Quantify parameters for impact models: C – environmental, gender, health, and NR effects
- Are there any other impacts of the research options so far not captured? Which?

→ ***Make results available to stakeholders via e-forum***

12.30 pm - Lunch break

2.00 pm – Plenary session (including 3.30 pm tea break)

- Groups report back to plenary on type C parameters
- Are there impacts of the research options not currently covered and (how) can we include them?
- Log of methodological issues: "What would we do differently the next time?"
- Overview of next steps and timeline to complete the study *(Diemuth Pemsl/Charles Staver)*
- E-forum feedback/update on parameters type A, B and C *(Geert Claessens & Claudine Picq)*
- Workshop evaluation and participant feedback; Wrap-up and closing

Annex 5. Workshop Program – actual

DAY 1 - 8TH APRIL 2013

9.00 am - Opening and welcome

- Welcome to Uganda from three hosting CG centers
  (Piet van Asten - IITA, Eldad Karamura - Bioversity, and Dominique Dufour - CIAT)
- Ice-breaker *(Meena Arivananthan)*

9.30 am - Overview of banana priority setting project

- Introduction to RTB and priority setting study *(Guy Hareau)*
- Banana priority setting methodology: Step by Step *(Tahirou Abdoulaye)*
- Procedure and results from participatory mapping *(Charles Staver)*
- Procedure and results from on-line expert survey *(Diemuth Pemsl)*

10.30 pm - Tea break

11.00 am - Overview of global expert workshop

- Speech by Dr. Ambrose Agona, Deputy Director General of NARO, Uganda and reading of opening speech on behalf of Minister for Agriculture, Animal Industry and Fisheries, (MAAIF), Uganda
- Review of expectations and experience with priority setting *(Meena Arivananthan)*
- Outline of workshop objectives and suggested procedure *(Diemuth Pemsl)*
- E-forum introduction and suggested procedure *(Geert Claessens & Claudine Picq)*
- Workshop house-keeping and questions *(Siifa Balinda Lwasa & Geert Claessens)*

13.00 pm - Lunch break

2.00 pm – Overview of global expert workshop (cont.) & Model parameters I

- Output of priority setting exercise, relevant impact models and parameter needs *(Diemuth Pemsl)*
- Instructions for group work and example how to fill the provided templates *(Charles Staver)*
- Break-up into working groups (AAA/diploid; AAA EAH; AAB plantain; AAB not plantain; and ABB)

2.15 pm - Working groups (by cultivar group) – including 3.30 pm tea break

- Quantify yield potential of the cultivar group
- Identify and describe two contrasting typical production zones (abiotic/biotic factors)
- Quantify average yields and yield variability for contrasting zones
- Identify major probable factors in yield variability
- Compile list of additional intervention options from the general areas of i) post-harvest, processing and marketing, ii) intra-household roles, decision making, and resource allocation, iii) household resource endowment (labor, capital, land, information); for each of the production zones
- Compile list of trends or (likely) future changes (e.g. climate change, spread of diseases)
- Short-list and rank up to 8 priority intervention options

→ ***Make results available to stakeholders via e-forum***

DAY 2 - 9TH APRIL 2013

9.00 am – Plenary session (including 10.30 am tea break)

- Opening and agenda for the day *(Diemuth Pemsl)*
- Log of methodological issues: "What would we do differently the next time?"
- Share and discuss working group results from Day 1
- E-forum feedback on yield gaps and intervention options *(Geert Claessens & Claudine Picq)*
- Cluster the 5 x 8 intervention options *(Meena)*
- Select top five researchable intervention options *(Meena/Diemuth)*
- Cross-check selected intervention options with regional priorities reported through expert survey
- Break-up into working groups (by intervention option) *(Meena Arivananthan)*

12.00 am - Working groups by intervention option

- Identify up to three distinct research options addressing the specific intervention option

13.00 pm - Lunch break

2.30 pm – Plenary session: Overview of RTB flagships

- Introduction to RTB flagship process *(Graham Thiele)*
- Presentation of draft banana flagships (and relevant cross-cutting ones) *(Dietmar Stoian)*

3.30 pm - Tea break

4.00 pm – Plenary session: Cluster research options

- Clustering of research options (attempt to identify 10 distinct research lines)

5.30 pm – Small group of volunteers

- Identify 10 distinct research lines in consultation with expert survey results

→ ***Make results available to stakeholders via e-forum***

DAY 3 - 10TH APRIL 2013

9.15 am – Plenary session:

- Opening and agenda for the day *(Diemuth Pemsl);* participant feedback on Day 2 *(Meena)*
- Present identified 10 distinct research options *(Uma Subbaraya Chetty)*
- Discussion of selected research options
- Instructions for group work and example how to fill the provided templates (Diemuth)
- Break-up into working groups by research option based on participants expertise

10.30 am - Working groups by research option (including tea break)

- Profile of the research option(s) using template
- Quantify parameters for impact models: A – Description of research options
- Quantify parameters for impact models: B – Yield, quality, cost, post-harvest, and processing effects

12.30 pm - Lunch break

2.00 pm - Working groups by research option continued (including afternoon tea break)

- Profile of the research option(s) using template
- Quantify parameters for impact models: A – Description of research options
- Quantify parameters for impact models: B – Yield, quality, cost, post-harvest, and processing effects

→ ***Make results available to stakeholders via e-forum***

5.00 pm – Plenary session

- Share group results for parameters type A and B *(Meena Arivananthan)*

7.00 pm – Social event: Snacks, drinks and music by the lake

DAY 4 - 11TH APRIL 2013

9.30 am – Plenary session:

- Opening and agenda for the day *(Diemuth Pemsl)*
- Log of methodological issues: "What would we do differently the next time?"
- Methodology to assess environmental, gender, health, and NR impacts *(Ulrich Kleinwechter)*
- Instructions for group work and example how to fill the provided templates (Diemuth)

10.30 am - Working groups by research option (including morning tea break)

- Discuss e-forum feedback and revise parameters type A and B if necessary
- Quantify parameters for impact models: C – environmental, gender, health, and NR effects
- Are there any other impacts of the research options so far not captured? Which?

12.30 pm - Lunch break

2.00 pm – Plenary session (including 3.30 pm tea break)

- Groups report back to plenary on type C parameters
- Remarks on procedure and role of ex-ante priority assessment by RTB Director *(Graham Thiele)*
- Overview of next steps and timeline to complete the study *(Diemuth Pemsl/Charles Staver)*
- E-forum feedback and statistics *(Geert Claessens & Claudine Picq)*
- Workshop evaluation and participant feedback *(Meena)*
- Wrap-up and closing *(Diemuth)*
- Closing remarks and farewell *(Rony Swennen, IITA and Eldad Karamura)*

Annex 6. List of Participants

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Annex 7. Workshop picture

Annex 8. Key Workshop Presentations

(can be consulted on Google Drive:
https://drive.google.com/folderview?id=0B6Bz11hHeOeJZlQ0c2V1ZmdiQjg&usp=sharing)

1) Introduction to RTB and priority setting study - ***Guy Hareau***
2) Banana priority setting methodology: Step by Step - ***Tahirou Abdoulaye***
3) Procedure and results from participatory mapping - ***Charles Staver***
4) Procedure and results of on-line expert survey - ***Diemuth Pemsl***
5) Outline of workshop objectives and suggested procedure - ***Diemuth Pemsl***
6) E-forum introduction and suggested procedure - ***Geert Jeff Claessens & Claudine Picq***
7) Output of priority setting exercise, relevant impact models & parameter needs - ***Diemuth Pemsl***
8) Introduction to RTB flagship process - ***Graham Thiele***
9) Presentation of draft RTB banana flagships (and relevant cross-cutting ones) - ***Dietmar Stoian***
10) Methodology to assess environmental, gender, health, and NR impacts - ***Ulrich Kleinwechter***

A broad alliance of research-for-development stakeholders & partners